Overview

Racial and ethnic minorities, as well as those residing in predominantly low-income areas, remain at high risk for lower-extremity amputation (LEA) due to complications resulting from diabetes. To date, there is little available research evidence to support prevention of LEA and the treatments that lead to better healthcare outcomes for those at high risk for LEA. The healthcare community—including patients, caregivers, and clinicians—wants to have access to the most beneficial information available to help prevent these amputations. However, there is still uncertainty about the best interventions to reduce disparities in LEA.

The Addressing Disparities program at the Patient-Centered Outcomes Research Institute (PCORI) is exploring research gaps in LEA. Specifically, we are looking to identify patient-centered comparative effectiveness research (CER) questions focusing on interventions that, if addressed, could reduce disparities in LEA among racial and ethnic minorities and low-income populations. The Addressing Disparities program is convening a multi-stakeholder workgroup comprising 10-12 members representing patients, researchers, clinicians, and other stakeholders to achieve the following:

- Obtain a diversity of perspectives and input on important patient-centered research gaps in LEA;
- Confirm the importance and timeliness of particular LEA research topics;
- Identify high-impact CER questions that will result in findings that are likely to endure and that are not currently studied;
- Understand the potential for LEA research to lead to rapid improvement in practice, decision making, and outcomes; and
- Seek consensus on identified LEA research gaps and specific comparative questions that address those gaps.

Background

LEA refers to the total loss of any part of the lower limb and can range from minor (i.e., an amputation performed below the ankle) to major (i.e., an amputation performed above the ankle). Diabetes is the leading cause of non-traumatic LEA in the United States. According to the 2014 National Diabetes Statistics Report, 29.1 million Americans (9.3%) have diabetes, with an additional 86 million Americans estimated to have prediabetes. With respect to racial and ethnic groups, 7.6% of non-Hispanic whites, 9% of Asian Americans, 12.8% of Hispanics, 13.2% of non-Hispanic blacks, and 15.9% of American Indians/Alaska Natives suffer from diabetes. Moreover, diabetes remains the seventh leading cause of death in the United States.

In 2010, diabetic complications resulted in over 73,000 non-traumatic LEAs, accounting for 60% of surgeries of this type. Diabetic foot ulcers are the leading cause of these amputations, preceding over
85% of these surgeries (other types of infections, trauma, tumors, and deformities account for the remaining). Diabetic patients carry a 25% risk of developing a foot ulcer within their lifetime. Inadequate diabetes control, smoking, neuropathy, prolonged hyperglycemia, and peripheral artery disease are risk factors that predispose diabetic patients to the development of foot ulcers. If a diabetic foot ulcer is left untreated, a patient may have to undergo amputation. Even if a diabetic foot ulcer is treated, the recurrence rate of an ulcer ranges from 35% at one year to 77% at five years, keeping patients at continuous risk for LEA.

Racial and ethnic groups experience disproportionate rates of LEA. As of 2009, African Americans experienced an amputation rate almost 50% greater than that of non-Hispanic whites. Medicare data from 2008 show that American Indian/Alaska Natives had an incidence rate double that of non-Hispanic whites. Not only does a disparity exist in the rate of LEA among minorities, disparities also exist in regard to the severity and level of amputation.

Current research also highlights that, in addition to the disparities seen among racial and ethnic minorities, significant geographic variation exists. Nationwide, those residing in predominantly low-income areas exhibit rates of non-traumatic LEA much higher than the rest of the population. The LEA rate in low-income neighborhoods is almost double that of higher-income neighborhoods.

LEA severely affects a patient’s quality of life. Not only does having an LEA affect a patient’s psychosocial, functional, and economic status, it also affects leisure, educational, and employment activities. Further, LEAs have additional consequences and outcomes. Forty-two percent of patients with LEA require having their opposite limb amputated within the subsequent one to three years. Within five years of the first LEA surgery, the mortality rate for patients ranges from 39% to 80.

Research conducted over the last decade suggests that intervening prior to the development of a foot ulcer is the most advantageous way to prevent LEA in a diabetic patient. Strategies for this include increased use of screening examinations by physicians and daily self-examinations by patients; referral of at-risk patients to a specialist; smoking cessation; maintenance of glycemic control; management of hypertension, renal disease, and peripheral arterial disease; and clinician and patient education. Once the wound has reached a critical point in which relying on traditional prevention methods is insufficient, a number of limb-sparing interventions exist. Revascularization procedures are commonly used to restore and increase circulation and blood flow to the affected limb. These include angioplasty, the insertion of a stent to open the blocked artery, and lower extremity bypass, where an alternate passage for blood flow is created to bypass the blockage. However, minority populations are less likely to undergo a revascularization treatment that could spare their limb and more likely to undergo amputation.

Current efforts to explain the disparities in LEA are broad and take into account a number of factors. One of the main theories points to systemic reasons, namely impaired access to multicomponent, interdisciplinary care (e.g., podiatrists, vascular surgeons, dieticians, educators). Additionally, patients at risk for LEA are often treated at safety-net hospitals, which may be inadequately equipped to provide the high-quality care needed for these high-risk individuals. A greater reliance might be placed on amputation procedures, as opposed to less invasive, limb-sparing treatment options, due to a lack of resources, on both the patient and provider end.
The existing disparities in LEA point to the need to better understand the research gaps. The US Department of Health and Human Services “Healthy People 2020” report specifically calls for the reduction in the rate of LEA in persons diagnosed with diabetes. In the past several years, little research has been conducted on prevention and treatment of patients with diabetes to reduce the incidence of LEA. While over 22,000 studies have been funded by NIH in diabetes between 2002 and 2011, only 33 were specific to foot ulcers. Of those studies focusing on foot ulcers, only one was comparative, highlighting the need for more research in this field. The little research that has been conducted over the last 25 years has suggested that implementing multicomponent, multidisciplinary interventions that follow standardized guidelines show the most promise for the reduction in the rate of LEAs. However, there are no agreed-upon guidelines for the treatment of diabetic foot ulcers or for determining when an LEA is necessary. Programs for increasing patient knowledge and engaging patients in preventive self-management have also shown promise.

There remains an even larger gap in the literature, with few studies focusing on reducing disparities among those at risk for LEA. Within the past decade, only four studies have been published that focus on interventions to reduce LEA disparities among racial/ethnic minorities and low-income groups. With an LEA being performed every 20 seconds on a diabetic patient, more research is needed to evaluate the effectiveness of complex interventions to improve lower-extremity amputation outcomes among populations likely to experience disparities, including racial and ethnic minorities and low-income populations.

Exploring Research Topics and Questions
PCORI is interested in identifying research questions that evaluate important choices faced by patients and that have a good chance of providing evidence that can reduce uncertainty, support decision making, change practice, and improve patients’ health outcomes. PCORI, through the multi-stakeholder workgroup, is seeking to identify gaps in research in lower-extremity amputations in racial and ethnic minorities and low-income populations to evaluate if this is an area where we can contribute to improving health outcomes.

Below are examples of research topics that PCORI could further explore:

- Compare the effectiveness of interventions to help eliminate healthcare system barriers that may disproportionately affect outcomes for racial and ethnic minorities and low-income populations at risk for LEA
- Compare the effectiveness of treatments with significant potential to improve health care and quality of life for racial and ethnic minorities and low-income populations at risk for LEA
- Compare the effectiveness of strategies to improve screening, increase access to quality care and reduce risk factors for racial and ethnic minorities and low-income populations at risk for LEA
References


